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reiterated defence of the usefulness of the 'dealer' or middleman in the economical structure of society might, but probably would not, have been penned by any one but a commission-merchant. As might be expected, the author's practical training produces the best results in those parts of the subject where a personal concern in affairs is essential to a thorough understanding. His chapters on banking, commerce, and credit are clear and incisive. There is no striking novelty in them, but the fresh and vigorous style clothes the old ideas with a living interest. In his treatment of the fundamental definitions and generally accepted principles of scientific economics, Mr. Danson is in many respects rather original than convincing. While deprecating the confusion that arises from the use of the same term in different meanings, he defines 'profit' in an entirely novel manner, and, on the strength of this, goes on to combat the theories of profit that have been proposed by economists who retain the old definitions. He maintains that profit is earned only by risk: it is therefore inseparable from capital. The manager who conducts business on borrowed capital receives only wages; for the lender risks the loss of his capital, and the additional rate of (so-called) interest he receives to cover the risk is really the 'profit.' On this theory, it is evident that Mr. Danson would limit the term 'interest' to the remuneration for loans on which the security is absolutely perfect, or, in general, to a purely hypothetical quantity, and would use 'profit' principally to denote the income of insurance companies. We doubt that economists generally will follow him.

'Rent' is another term in respect to which our author courts originality. He regrets the variety of meanings assigned to the word, and proceeds to mend matters by setting forth an entirely new one. We shall not follow him in his career. Ricardo will doubtless survive the latest sceptic's assault. The result of our author's doctrine is wrought into a radically conservative view of the modern land-question. Henry George is neatly annihilated by a demonstration of the fact that there is no such a thing as an 'unearned increment' in the value of land. The general treatment of the land-question indicates a probability that some of the profits, or rather 'wages,' of the commission-merchant have found investment in an English estate.

On the labor and wages question, Mr. Danson cleaves to the old school. The interests of labor and capital are identical, and all that the laborers have to do is to eschew trades-unions and become millionnaires as soon as possible. Inspection-laws for factories, like poor-laws, are inherently vicious,

and, in general, *laissez faire*; some of which sentiments indicate that a Liverpool commission-merchant feels under no necessity of advancing merely because the rest of the world does.

WM. A. DUNNING.

SOME RECENT MINERALOGICAL TEXT-BOOKS.

Manual of mineralogy and petrography. By JAMES D. DANA. 4th ed. New York, Wiley. 12°.

THE well-known manual of Professor Dana appears in much its former guise, but with such alterations as are needful to keep it abreast of the progress made in mineralogical and petrographical science during the nine years which have elapsed since the publication of the third edition. The old arrangement is preserved throughout, which will prove acceptable to those who are already familiar with the book. It is only intended for an elementary treatise, for the use of schools or of the practical miner and geologist: hence the arrangement of the species according to their principal metallic base is advantageous. The full list of American localities and the tables for determining minerals are also valuable addenda. The chapter on rocks has undergone extensive changes. The terms 'petrography' and 'petrology' are preferred to 'lithology,' which was formerly used. The various grounds of classification are stated, and the rocks divided into, 1°, calcareous; 2°, fragmental, not calcareous; 3°, crystalline, not calcareous. The arrangement of the members of the last class is much like that of Rosenbusch. The banded and schistose varieties are classified with the massive ones, but they are for the most part considered 'metamorphic,' by which term the writer seems to imply that they are altered sediments. The metamorphism of eruptive rocks into schists seems hardly to have secured recognition. Altogether the book is increased by only forty-three pages, but its many improvements will secure it a welcome among all teachers.

Tables for the determination of common minerals. By W. O. CROSBY. Boston, J. A. Crosby. 8°.

Professor Crosby's tables are intended to aid beginners in the identification of the commoner minerals, chiefly by means of their more apparent physical properties, and then to show them how the determination may be confirmed by simple chemical tests. The classification is, 1°, according to lustre (metallic and non-metallic); 2°, according to the color of the metallic, and the streak of the non-metallic minerals; and, 3°, according to the hardness. In this way forty-one classes are formed, which are further subdivided in the analytical key by specific gravity, texture, crystal form, cleavage, etc. The method is the result of

five years' practical experience, and must possess great advantages for the class of students for whom it is intended.

A catalogue of minerals alphabetically arranged. By A. H. CHESTER. New York, Wiley.

Professor Chester's catalogue is best described by an extract from its preface: "This list is intended to embrace all English names now in use in the nomenclature of mineralogy. It includes species, varieties, and synonyms. Well-authenticated species are put in full-faced type. Dead and useless names have been omitted, so that the catalogue can be conveniently used as a check-list and in cataloguing collections." The list seems very complete, and admirably adapted for purposes stated by its author.

G. H. WILLIAMS.

THE CHEMISTRY OF THE SUN.

MR. LOCKYER'S new book is unquestionably the most important work in the department of astronomical physics which has appeared for several years: it is especially interesting and valuable as coming, not from a compiler and dealer in second-hand materials, but from an original worker, who has himself made most of the observations and investigations on which his conclusions depend. We do not mean, however, to imply that he either ignores or is ignorant of the work of others, or fails to make proper use of it: in fact, he brings together a very complete account of all that bears upon his subject, with due credit to his fellow-workers and a generous appreciation of their labors and opinions, even when their conclusions differ from his own.

While the book can perhaps hardly be called a 'popular' exposition of its subject, it is certainly not *un*-popular, — not unnecessarily technical or abstruse; and the vivid, enthusiastic, perhaps here and there just slightly sensational, style of the author helps to make it attractive: so that it seems likely to be far more extensively read than most volumes of its class.

The main purpose of the writer is to present the spectroscopic evidence in favor of the hypothesis that our so-called elements are not truly elementary, but so constituted that they can be broken up, or 'dissociated,' into still more elementary components by the action of heat; and that on the sun and stars they are actually so dissociated by the high temperatures there prevailing.

In the preface, after pointing out the decomposing power of higher and higher temperatures as actually observed in our laboratories, the author adds as a sort of summary of his argument, "The question then, it will be seen, is an appeal to the

The chemistry of the sun. By J. NORMAN LOCKYER. New York, Macmillan. 8°.

law of continuity, nothing more and nothing less. Is a temperature higher than any yet applied to act in the same way as each higher temperature which has hitherto been applied has done? Or is there to be some unexplained break in the uniformity of nature's processes?"

The first seven chapters of the twenty-eight which make up the book are mainly historical, occupied with an account of spectroscopic work previous to 1866, and giving perhaps the best *résumé* of the work of Wollaston, Fraunhofer, Kirchhoff, Angstrom, and others, that can be found in the same space. The next three chapters discuss what the writer calls 'A new method in spectroscopy,' and its results. The 'new method' consisted merely in attaching the spectroscope to a telescope, and studying the spectrum of an object in *detail*, instead of in gross, so to speak. Huggins seems to have been the first to employ this 'new method' in his examination of the nebulae in 1864; but Mr. Lockyer was the first to employ it upon the solar surface in 1866.

The results were the recognition of many peculiarities in the spectra of sunspots and faculae, the development of the method of observing the chromosphere and prominences without an eclipse, and the detection of remarkable modifications of many lines in the spectrum, such as widenings, reversals, contortions, etc., all significant and evidently depending upon the physical conditions of temperature and pressure prevailing at that special point of the solar surface which happens to be imaged on the slit of the spectroscope at the moment of observation.

This is followed by an account of the author's early laboratory-work, especially his investigation of the so-called 'long and short lines' in elementary spectra, and the coincident lines in different spectra. This brings us down to 1873.

The next three chapters discuss the 'difficulties' that had presented themselves, and seemed to require a remodelling of the received theories. Our space does not permit a presentation of these difficulties here; but it must suffice to say that they are such as absolutely to compel us to suppose that a given element, such as iron for instance, either gives widely different spectra under different circumstances, the spectrum tending towards simplicity under the very highest temperatures, or else that it is decomposable.

This idea, that our elements are only relatively elementary, while really composed of still simpler substances, is no new one, as Mr. Lockyer himself points out, but had previously been brought forward, and more or less strongly advocated, by Dumas, Brodie, Sterry Hunt, and others, though not on spectroscopic grounds.